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MARKETING RESEARCH  
REPORT NO. 892

# THE FARM MACHINERY AND EQUIPMENT INDUSTRY :

## Its Changing Structure and Performance

U.S. DEPARTMENT OF AGRICULTURE . ECONOMIC RESEARCH SERVICE .



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## ABSTRACT

The farm machinery and equipment industry diversified substantially between 1954 and 1966. Firms outside the industry acquired facilities within it, and firms within it acquired facilities outside. Establishments and companies with 500 or more employees greatly decreased in numbers. Expenditures for salaries, wages, fringe benefits, advertising, research and development, and State and local taxes increased significantly. Profits as a percentage of net worth fluctuated, ranging from 1.3 to 10.9 percent. These were lower than for most other industries. If present trends continue, most establishments within this industry will be member units within multiunit, and multiunit, multi-industry companies. While economies of scale of production appear achievable by relatively small firms, economies associated with such facilitating functions as large-scale advertising, research and development, and information retrieval via computers, appear beyond their reach. Such structural changes, when accompanied by expanding sales, encourage nonprice competition, and the "passing on" of costs to the dealer level. Changes in the structure of agriculture, as well as changes in dealer arrangements at the retail level, will largely determine the extent to which price changes for dealers can be passed on to farmers.

Keywords: farm machinery and equipment, structure, performance, nation, time-series, secondary sources, profits, wages, salaries, and advertising R and D.

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## SUMMARY

Market structure and conduct at both the manufacturing and retail levels have brought about many changes in the farm machinery and equipment industry. Structural changes of note at the manufacturing level, 1954-66, include: (1) greater diversification achieved by both the acquisitions of firms within the industry by firms from other industries, and the acquisitions of firms in other industries by firms within the industry; (2) entry of new firms into the industry, particularly those with less than 100 employees; and (3) decline in the number of both firms and establishments with 500 or more employees.

Pricing practices pursued during 1954-66 reflected both "market conditions" and "administrative strategies," depending on the time and circumstance. For instance, during some years, costs dropped as prices, sales, and profits rose. In contrast, in one year, prices dropped, sales and profits dropped, and costs rose by about 14 percent. And in some other years, prices and costs reflected similar trends while profits held stable.

Certain costs rose substantially. Expenditures per firm for salaries and wages, excluding executive compensation, rose 48 percent between 1954 and 1966. Fringe benefits likewise increased, by 104 percent. Executive compensation, while fluctuating, displayed a slight upward trend.

Only firms with 1,000 or more employees expended funds for applied research and development (R and D), and firms with 10,000 or more employees accounted for 80 percent of the total R and D effort of \$110 million in 1967. In 1964, R and D expenditures covered 10 industries, with only 14 percent spent for such diversified activities as the manufacture of paper and allied products, aircraft, and missiles. Only 2 years later, expenditures for diversified activities had risen 22 percent and encompassed food and kindred products as well, along with scientific instruments.

Average advertising expenditures per firm fluctuated, but by 1966 were about 7 percent greater than the firms' 1957-59 average. During 1954-66, firms with \$50 million or above in assets increased their share of total advertising expenditures by about 12 percent. By 1966, they accounted for 53 percent.

Industry remittances for State and local taxes (excluding income) rose about 129 percent between 1954 and 1966. Tax remittances as a proportion of total corporate costs rose by 22 percent, from 1.8 to 2.2 percent.

After-tax profits as a percentage of net worth fluctuated, ranging from a low of 1.3 percent in 1960 to a high of 10.4 percent in 1966. Simultaneously, the amount of income after taxes that was channeled toward retained-earnings accounts trended slightly downward, from about 4.2 percent of net worth to approximately 3.3 percent. Slight fluctuations both above and below these figures occurred in between the 2 years.

In comparison, for the period studied, profits after taxes as a percentage of net worth for the engine and turbine, all durable goods, and baking industries generally were higher than for the farm machinery and equipment industry. Only toward the end of the period did profits of the farm machinery and equipment industry equal or exceed those of the baking industry, or approach the levels achieved by engine and turbines, and all durable goods. In 1960 and 1961, the returns received by the farm machinery and equipment industry actually fell below the prime rate of interest paid for commercial paper.

Entry and diversification have encouraged an industry structure that may lead to increased emphasis by manufacturers on brand names, product quality improvement, R and D expenditures, advertising, and service, in contrast to price competition.

Diversification at the manufacturers' level (with less and less dependence on farm machinery and equipment items for company profits) also suggests that large, diversified production firms may reconsider the kind and structure of retail dealer arrangements that best fit their total needs.

THE FARM MACHINERY AND EQUIPMENT INDUSTRY:  
Its Changing Structure and Performance

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INTRODUCTION

Farmers depend on the farm machinery and equipment industry for capital goods and expect the industry to perform effectively. Although they trade with local retailers, farmers are often affected by changes occurring at the manufacturing level. Any losses of productive and distributive efficiency that result in higher total costs may show up in prices charged the retailer and, in turn, in prices he charges the farmer. Changes in the quality of the products sold affect both dealer and farmer. Manufacturer-sponsored services and warranties frequently offered by the dealer likewise affect the farmer. Many of these changes may be associated directly with the structure and conduct of the industry at both manufacturing and retail levels.

This report provides some indication as to what changes have occurred in the structure of the farm machinery and equipment industry. Following this, it discusses what these changes may mean to industry conduct and performance, and, through the actions of retail dealers, to farmers.

The time periods for which various analyses could be made were not all the same. Data from the Census of Manufacturers were available generally for 1958 and 1963, but only selected series were available for 1967. Changes in definitions of industries by the Census Bureau in 1957 made data for earlier years noncomparable. Statistically comparable data from the Source Book of the Internal Revenue Service (IRS) were available for a longer period, 1954-67.

CHANGES IN STRUCTURE

Census data on the structure of the farm machinery and equipment industry are reported both on an establishment (Standard Industrial Classification (SIC) code 3522) and a Census company code (35-B) basis. Census allocates an establishment to an industry if its production of primary products of that industry exceeds in value its production of products of any other single industry. <sup>1/</sup> Thus, aggregative data such as value of shipments and numbers of employees for plants classified in a given industry may not be very indicative of the true picture for that industry. However, the small amounts for products of other industries included in aggregated data for individual establishments of the farm machinery and equipment industry have a modest effect on establishment results reported here. <sup>2/</sup>

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<sup>1/</sup>For a precise definition, see Bureau of the Census, Census of Manufacturers, 1958, vol. II, Industry Statistics, part 2, major groups 29-39, p. 5.

<sup>2/</sup>In 1963, the establishment specialization ratio was 89 percent for those in SIC 3522.

An establishment, or plant, may also be a company, in which event it is classified by Census as a single-unit, single-industry firm. However, a plant may be one of several plants having similar output from similar activities or processes of a company. If this company has no plant, mine, store, warehouse, or other establishment in another industry, it is called a multiunit, single-industry firm. If at least one establishment is in another industry, the company is classified as a multiunit, multi-industry firm. If the company is a parent company owning or controlling subsidiary companies, Census includes within the parent company all establishments of the subsidiary companies.

Companies primarily classified in 35-B long have been recognized as maintaining ownership and control of establishments from numerous industries. Thus, we could accomplish only a moderate amount from detailed analysis of company data. In analyzing company data, we emphasized direction of control in large measure.<sup>3/</sup> Questions of interest were: Does company management view its farm machinery and equipment establishments as the primary source of its principal products, or as the source of secondary products? What trends have occurred in the direction of control?

### Size and Number of Establishments

In most manufacturing industries, establishments have become fewer in number, larger in size, and less specialized in economic function.<sup>4/</sup> The farm machinery and equipment industry (SIC 3522) diverges from this more customary growth pattern in several ways.

Between 1958 and 1963, although the total number of SIC 3522 establishments grew by 6.7 percent, the entire growth occurred in plants with 0-99 employees. Establishments with 100-499 employees declined in number by 4.4 percent, and those with 500 or more employees, by 4.7 percent. The total number of employees hired at plants within each size category also reflected this shift. Total employment in plants having 500 or more employees declined by 0.6 percent. Employment by middle-sized plants grew by 7.2 percent, in contrast to the 13.5-percent growth experienced by plants with 0-99 employees (table 1).

While all size categories experienced increases in total payroll, value added, value of shipments, and new capital expenditures, only plants falling in the largest size category grew less than the industry average. Comparisons by size groups, by focusing on changes in proportion attributable to specified size categories, further emphasized these alterations in structure.

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<sup>3/</sup>Bureau of the Census, Enterprise Statistics, 1968, part 1, General Report on Industrial Organization, p. 2. For the farm machinery and equipment industry, enterprise industry category 35-B is the nearest equivalent to the SIC 3522 category of establishments. Not all establishments classified as SIC 3522, however, are owned by companies classified in 35-B.

<sup>4/</sup>A tabulation of the 395 4-digit manufacturing industries reported in the Census of Manufactures for 1954-63 (1958-63 where noncomparability was involved) showed most establishments became less specialized. About 15 percent retained the same specialization ratio over 1954-63.



Table 1.--Employment, payroll, value added, value of shipments, and new capital expenditures by all establishments, farm machinery and equipment industry, 1958, 1963, and 1967. <sup>1</sup>

Item	Unit	All establishments		1958-63 percentage change in establishments with total employment of--		Percentage change, all establishments		
		1958	1963	0-99	100-499	500 and over	1958-63	1958-67
Establishment .....	No.	1,469	1,568	8.1	-4.4	-4.7	6.7	NA
Total employment ..	Thous.	109	113	13.5	7.2	-0.6	3.7	29.4
Payroll .....	Mill. dol.	551	689	30.7	26.7	23.2	25.0	79.5
Value added (adjusted) .....	do.	1,088	1,328	37.8	22.0	18.2	22.1	92.2
Value of shipments .....	do.	2,422	2,842	27.2	14.4	15.7	17.4	82.8
New capital expenditures .....	do.	50	64	46.1	46.9	21.1	28.0	192.0

<sup>1</sup>Total establishment figures, computation of percentage changes by establishment size, and so on, based on table 4, Bureau of the Census, 1958 Census of Manufactures, General Statistics, Vol. 11, part 2, Major Groups 29-39, U.S. Govt. Print. Off., p. 35-A-9; and 1963, p. 35-A-11; and 1967 Census of Manufactures, Preliminary Report, series M67, Apr. 1969, pp. 11 and 14.

Note: NA means not available.

## Changes Among Size Categories

Comparisons of the proportion of total industry expenditures and receipts accounted for by each category in 1958, and again in 1963, pointed out changes in relative importance among large, medium-sized, and small establishments. Changes in the proportion of total value added, value of shipments, and new capital investment attributable to each category indicated an increase in the relative importance (1958-63) of establishments with 0-99 employees and a relative decline in importance for establishments with over 500 employees (table 2).

While the smallest category grew by 1.3 percent during 1958-63, the categories of larger plants declined by 10.3 percent. More important were the gains in value added, value of shipments, and new capital investment by the smallest establishment group, and the decline in their share of the total by the establishments with 500 or more employees. The establishments with 0-99 employees gained 13.0, 8.4, and 13.4 percent, respectively, for value-added, value of shipments, and new capital expenditures. Corresponding figures for establishments with 500 or more employees showed declines of 3.3, 1.4, and 6.4 percent. Even so, establishments with 500 or more employees still accounted for about 64 percent of the total industry payroll.

## Number and Type of Companies

The number of companies having at least one establishment classified in the farm machinery and equipment industry increased from 1,347 in 1958 to 1,424 in 1963 (table 3). The creation of new single-establishment companies (72 of the 77 new companies) accounted for practically all of this growth. These establishments also were relatively small in size, falling in the 0-99 employee category.

Multiunit, multi-industry firms fared quite differently from multiunit, single-industry firms. The former grew in company and establishment numbers, numbers of employees, total payroll, sales and receipts, and value added. The latter grew in company numbers but suffered severe declines in all other measures. Sales and receipts for this group dropped by 53.4 percent; numbers of employees by 39.5 percent; and establishment numbers by 37.0 percent (table 4).

Multiunit, single-industry establishments declined. Simultaneously, multiunit, multi-industry companies and their establishments grew substantially. For this group, number of companies grew 9.3 percent; establishment numbers, 33.6 percent; total employment, 36.1 percent; sales and receipts, 61.5 percent; and value added, 66.2 percent. This diversified growth coincided with the surge of conglomerate growth recorded by other industries during this same timespan and thus may reflect forces not limited to the farm machinery and equipment industry. This evidence also is consistent with the idea that diversification has occurred, both by firms reaching into SIC 3522 and by firms primarily in SIC 3522 acquiring establishments and companies in other industries.

Aside from showing companies with SIC 3522 establishments, table 3 also presents a different view of structural change for the farm machinery and equipment industry, showing changes in employment size of companies composing the industry. Specifically, the number of single-establishment companies with 0-99 employees grew by 6.1 percent, and establishments with 100-499 decreased by 3.6 percent. While one establishment with 500 or more employees was classified under SIC 3522 in 1958, by 1963 there were none.

Table 2.--Proportion of total establishments, payroll, value added (adjusted), value of shipments, and new capital expenditures accounted for by establishments, by employment size, farm machinery and equipment industry, 1958 and 1963 <sup>1/</sup>

Item	Employment size									
	0-99		100-499		500 and over		1958-63		1958-63	
	Percentage of universe	Percentage change	Percentage of universe	Percentage change	Percentage of universe	Percentage change	Percentage of universe	Percentage change	Percentage of universe	Percentage change
Establishments .....	89.2	1.3	7.8	7.0	-10.3	2.9	2.6	-10.3	2.6	-10.3
Total employment .....	19.4	9.3	19.8	20.5	3.5	60.8	58.2	-4.3	58.2	-4.3
Payroll .....	16.4	4.3	18.2	18.5	1.6	65.4	64.4	-1.5	64.4	-1.5
Value added (adjusted) .....	16.1	13.0	19.2	19.2	0.0	64.7	62.6	-3.3	62.6	-3.3
Value of shipments .....	16.7	8.4	21.0	20.5	-2.4	62.3	61.4	-1.4	61.4	-1.4
New capital investments .....	19.4	13.4	13.3	15.1	13.5	67.2	62.9	-6.4	62.9	-6.4

<sup>1/</sup>Computed from Census of Manufactures figures; see footnote 1, table 1.

Table 3.--Structural changes in companies, farm machinery and equipment industry, 1958-63 <sup>1/</sup>

Industry structure	Total industry		Percentage change in companies with employment of--				All companies
	1958	1963	0-99	100-499	500 and above	10,000 and above	
	Number					Percent	
<b>Total industry:</b>							
Companies .....	1,347	1,424	6.5	-7.2	13.3	0.0	5.7
Establishments .....	2,162	2,453	7.4	-25.7	37.8	39.3	13.5
Employees .....	148,132	187,595	10.3	2.1	32.5	35.2	26.6
<b>Single-establishment:</b>							
Companies .....	1,283	1,355	6.1	-3.6	<u>2/</u>	<u>3/</u>	5.6
Establishments .....	1,283	1,355	6.1	-3.6	<u>2/</u>	<u>3/</u>	5.6
Employees .....	27,082	29,134	9.4	NA	<u>2/</u>	<u>3/</u>	7.6
<b>Multiunit, single-industry:</b>							
Companies .....	21	22	42.9	12.5	-50.0	0.0	4.3
Establishments .....	108	68	29.4	21.2	-89.7	0.0	-37.0
Employees .....	8,338	5,046	NA	NA	NA	0.0	-39.5
<b>Multiunit, multi-industry:</b>							
Companies .....	43	47	20.0	-25.0	75.0	0.0	9.3
Establishments .....	771	1,030	45.2	-46.9	50.2	39.3	33.6
Employees .....	112,712	153,415	NA	-25.2	NA	35.2	36.1

<sup>1/</sup> Computations are based on data found in Bureau of the Census, Enterprise Statistics: 1963, part I, General Report on Industrial Organization, U.S. Govt. Print. Off., pp. 204-205.

<sup>2/</sup> In 1958, there was only 1 of these companies, and its employment fell between 500-999. In 1963, there were no companies.

<sup>3/</sup> Census data for several categories of employment size present only ranges of total employment to avoid disclosure. Note: NA means not available.

Table 4.--Changes in company structure, farm machinery and equipment industry, 1958-63 1/

Item	Percentage change, 1958-63					
	All companies		Single-unit, single-industry	All multiunit companies	Multiunit companies	
					Single-industry	Multi-industry
	----- Percent -----					
Companies .....	5.7	5.6	7.8	4.8	9.3	
Establishments .....	13.5	5.6	24.9	-37.0	33.6	
Employees .....	26.6	7.6	30.9	-39.5	36.1	
Payroll .....	57.1	23.0	63.1	-32.5	69.2	
Sales and receipts .....	43.9	20.8	48.6	-53.4	61.5	
Value added .....	53.1	26.2	11.8	-20.3	66.2	

1/ Computations based on: Enterprise Statistics, 1958, op. cit., p. 66; and 1963, p. 106.

In the multiunit, single-industry category, the number of companies with 0-99 employees grew by 42.9 percent. The corresponding growth for companies with 100-499 employees was 12.5 percent; however, companies with 500 or more employees dropped in numbers by 50 percent. This multiunit, single-industry growth pattern for companies with 500 or more employees approximated the pattern for single-establishment, single-industry firms with 500 or more employees. 5/ The largest sized single-establishment firms and multiunit, single-industry firms both declined in numbers, while numbers in the smallest sized categories of each grew. If substantial economies of scale had been associated with these largest sized single-establishment firms and multiunit, single-establishment firms, there probably would have been associated "economies-of-scale barriers" to entry, which would have prevented this type of growth pattern.

The multiunit, multi-industry companies provide real contrasts. Companies with 0-99 employees increased in numbers by 20 percent, while those with 500 employees and above increased by 75 percent. In establishment numbers, an increase of 45.2 percent occurred for companies in the 0-99 class; 50.2 percent for companies with 500 employees or more; and 39.3 percent for those with 10,000 or more. The middle group, 100-499, decreased by 46.9 percent in numbers. This decrease may have been caused by company movement from the 100-499 category to the large-sized category of 500 and above.

Comparisons in terms of employment are not clear. Because of disclosure limitations, the Bureau of the Census gives only very broad ranges of employment increase for certain categories. Thus, we had data only for companies with 100-499 employees and with 10,000 or more. The former decreased by 25.2 percent, but the latter grew by 35.2 percent. This growth by large companies reflects the trend toward conglomerate structure, as it came primarily from expansion into non-SIC 3522 activities.

5/ These data do not provide any more rigorous indicator of economies of scale for the multiunit, single-industry firm than for the single-industry, single-establishment firm. However, the broad pattern of movement and the relative changes in numbers do suggest that if economies of scale were present, they were captured before the single establishment had 500 or more employees, and also before the multiunit single-industry firm had 500 or more employees.

Two developments stand out: (1) A movement toward industry diversification took place, by companies moving into the industry and by companies within the industry becoming active in other industries; and (2) when companies classified under category 35-B grew, they did so by acquiring establishments classified outside SIC 3522. Companies that grew within 35-B, by horizontal growth, plateaued at a level from 100-499 employees. Beyond this size, their growth came from outside the industry.

The diversification associated with the development of the multi-industry, multiestablishment firm should show in both its ownership and industry specialization ratios. The ownership ratio was computed by taking the total number of SIC 3522 establishments of companies primarily classified under 35-B, and dividing it by the total number of establishments classified under SIC 3522. This ownership ratio also may be computed by using the numbers of employees in SIC 3522 establishments owned by companies under category 35-B, and dividing them by the total number of employees in establishments classified under SIC 3522.

In contrast, the industry specialization ratio may be computed by using the total number of SIC 3522 establishments owned and controlled by companies classified under 35-B, and dividing these by the total number of establishments (SIC 3522 plus all others) owned by 35-B companies. In the company ownership ratio, establishments classified under SIC 3522 but owned by companies not classified under 35-B entered the calculations, whereas in the industry specialization ratio, they did not. <sup>6/</sup>

The company ownership specialization ratio declined from 97.0 to 96.2 percent from 1958 to 1963. <sup>7/</sup> However, the extent of growth of diversification implied by changes in either company or establishment counts is not as accurate as the statistic based on numbers of employees associated with the same company numbers. This is particularly true for 35-B, as a couple of companies switched classification between 1958 and 1963. The biggest difference in specialization ratios (measured by company counts and by numbers of employees) is that the company count frequently gives a much higher measure of ownership specialization than does the employee count. Thus, when ownership specialization was computed by numbers of employees, the drop was 4.0 and not .8 percent. <sup>8/</sup>

Use of employee counts as the basis for computing the industry specialization ratio showed much greater diversification. The industry specialization ratio dropped by 22.8 percent between 1958 and 1963. <sup>9/</sup> Thus, when both the index of ownership and the index of industry specialization were used, companies classified within 35-B experienced a substantial growth in diversification. <sup>10/</sup>

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<sup>6/</sup>Enterprise Statistics, 1963, op. cit., p. 37.

<sup>7/</sup>Ibid., 1958, p. 66; and 1963, p. 65. In numbers of employees, the ratio declined from 84.3 to 80.9, 3.4 index but 4 percentage points.

<sup>8/</sup>Ibid.

<sup>9/</sup>Ibid., 1958, p. 66; and 1963, p. 65.

<sup>10/</sup>This diversification at the company level contrasts with changes at the establishment level. At the establishment level, establishments primarily SIC 3522 had a drop in the specialization ratio of 1.1 percent. However, the interpretation of this statistic at the establishment level must be made with the recognition that SIC 3522 establishments may perform any one of 93 manufacturing activities and remain within this category. These 93 activities include the manufacture of such diverse products as stoneboats and windrowers, as well as tractors and snowblowers. Bureau of the Budget, Standard Industrial Classification Manual, 1967, U.S. Govt. Print. Off., p. 151.

One additional dimension is needed to understand the drop in the number of establishments with 500 or more employees--for both single-establishment, single-industry companies and multiestablishment, single-industry companies. The Bureau of the Census, using value of shipments by the largest companies for the 1963-66 period, found that the largest four increased their share from 43 to 45 percent and the largest eight, from 55 to 59 percent. By 1963, the largest 50 companies accounted for 77 percent of the total value of shipments for SIC 3522. <sup>11/</sup> While strictly comparable concentration data were not available for the 1958-63 period, trends depicted by the 1963-66 data probably applied during the earlier period.

#### SOME CONDUCT AND PERFORMANCE COMPARISONS

Market structure influences conduct, and conduct operates continuously to produce market performance. Thus, analysis of market structure is sterile unless it can be seen that structure encourages a climate for conduct that results in particular kinds of performance. Unfortunately, the broad coverage of the farm machinery and equipment industry's Census classification and the substantial diversification by both its establishments and companies compound the difficulty of making conduct and performance measurements of this industry. <sup>12/</sup> For instance, costs and profits cannot be disaggregated at the level necessary to represent the manufacture of farm machinery and equipment items used primarily on farms or to separate domestic sales from total sales of such items.

Thus, if a farmer wishes to know if the profits obtained by farm machinery manufacturers from their domestic sales of tractors and combines are "too high," these data can not answer his question. If the manufacturer wishes to know if his costs for manufacturing tractors for domestic sales are comparable to those for his competitors, these data can not answer his question.

Even so, the data can show how 35-B firms of a given size and with the reported extent of diversification have fared. Over time, they also can show whether establishments and companies with this classification have achieved more or less diversification, and how the overall performance of such firms has trended. Such performance analyses can be used in public policy considerations, but only within the binding constraints imposed by this classification situation. More precise analyses and conclusions could be drawn if the SIC classification could be redefined with narrower boundaries.

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<sup>11/</sup>Bureau of the Census, Annual Survey of Manufactures: 1966, Value of Shipment Concentration Ratios by Industry, M66 (AS)-8, U.S. Govt. Print. Off., p. 21. When computing concentration ratios, Census defines as a company all single-establishment firms, and all establishments of multiestablishment firms whose establishment class is the same as the primary industry category. Thus, in this case, a multiestablishment firm consists only of all multiestablishment, single-industry companies. In other words, only establishments classed as SIC 3522 are included. If a multiestablishment firm had 5 establishments, 3 under SIC 3522, and 2 under SIC XYZO, only the 3 SIC 3522 establishments would be included in concentration-ratio computations.

<sup>12/</sup>The establishment specialization ratio (value-of-shipments basis) was 89 percent in 1963. The company specialization ratio (sales-and-receipts basis) was 55 percent. Census of Manufactures, 1963, op. cit., p. 35-A-7; and Enterprise Statistics, 1963, op. cit., p. 65.

## Conduct Measures

### Advertising

The necessity for and the power of advertising have long been recognized by company management in the United States. While expenditures for advertising have been particularly important at the retail level, large manufacturing firms have been increasing their expenditures. Table 5 shows that the farm machinery and equipment industry has been no exception. Since 1960, firms with more than \$250 million in assets have accounted for over half the industry's total advertising expenditures. Their average share for the 1954-59 period approximated 50 percent and for the 1960-66 period, about 53 percent.

While the largest firms increased their share of total advertising expenditures from 1957 to 1961, average advertising expenditures per firm declined. This suggests that more firms were advertising, as otherwise, the average would not have declined. Since 1962, the average expenditure per firm has increased. The biggest spurt occurred during the 1965-66 period. This increase may reflect growth of large firms that were multi-industry as well as multiunit.

Table 5 compares all firms in the farm machinery and equipment industry with those of \$250 million assets or above. When column 4 was subtracted from column 3, we obtained the yearly difference in cost per dollar of taxable income received by the largest group. For 1954-64, these firms maintained an advertising cost per dollar of taxable-income differential of more than 5 cents, with an average of 6.3 cents. For 1965 and 1966, this average dropped to about 4 cents. During this same period, the largest eight firms increased their market share from 55 to 59 percent of the total value of shipments.

Large firms were more diversified than small ones, and their expenditures for advertising were substantially greater. Thus, advertising expenditures may be associated with product diversification, as well as size of firm. A hypothesis was made that there was no difference between diversified and specialized firms in the number of firms reporting this greater-than-the-combined category median expenditure for advertising. This was tested using the Chi-square and the contingency coefficient. The computed Chi-square value was 2.02, and the contingency coefficient was .25 out of a possible .7. The computed Chi-square value could have been obtained because of chance 13 times out of 100. Thus, it appears likely that some association exists between product diversification and amounts spent on advertising, as well as between such expenditures and size of firm.

### Expenditures for Applied Research and Development (R and D)

Expenditure data for applied research and development were available starting in 1959. They showed substantial and consistent increases, especially from 1961 through 1967. The overall increase during 1959-67 was 64 percent. Comparisons with other industries showed that the farm machinery and equipment industry's expenditures exhibited fluctuations of smaller magnitude (table 6).

The overriding impression in each of the industries examined is one of growth and expansion, particularly for 1961-67. Their R and D expenditures are consistent with the emphasis on quality and new-product competition associated with large corporations.



Table 5.--Comparisons of advertising expenditures, farm machinery and equipment industry, 1954-66 1

Year	Index of advertising expenditures per firm (1957-59 = 100) (1)	Percentage of total annual expenditures by firms with assets of \$250 million or more (2)	Advertising expenditures per dollar of taxable income	
			All firms (3)	Firms with assets of \$250 million or more (4)
		Percent		Cents
1954	78.3	47.5	15.6	9.7
1955	100.2	50.1	13.5	8.5
1956	113.3	49.4	13.5	7.7
1957	113.4	48.9	17.5	10.7
1958	91.6	57.7	17.4	12.4
1959	95.0	46.2	15.1	9.0
1960	76.5	59.7	37.5	29.0
1961	73.1	50.2	36.7	29.2
1962	86.1	NA	22.6	NA
1963	88.8	52.4	25.2	18.6
1964	74.1	54.6	16.2	10.6
1965	87.2	52.7	15.0	10.4
1966	106.6	53.3	11.7	8.5

1/Computed from IRS, Statistics Division, Source Book, 1954-66.

Note: NA means not available.

Firms with 1,000 or more employees made all the farm machinery and equipment industry's R and D expenditures in 1967. Firms with 10,000 or more employees accounted for 80 percent of these expenditures. <sup>13/</sup>

Table 6.--Funds for applied research and development, selected industries, 1956-67 <sup>1/</sup>

Industry	: 1956:	: 1957:	: 1958:	: 1959:	: 1960:	: 1961:	: 1962:	: 1963:	: 1964:	: 1965:	: 1966:	: 1967:	: Percentage change, 1956-67
: - - - - - Mil. dol. - - - - -													
Agricultural chemicals .....	: NA	: NA	: 22	: 35	: 27	: 38	: 42	: 45	: 2/49	: 64	: 77	: 89	: 154
Food and kindred products .....	: 58	: 68	: 71	: 74	: 92	: 92	: 98	: 102	: 119	: 131	: 130	: 144	: 95
Farm machinery and equipment .....	: NA	: NA	: NA	: 67	: 75	: 65	: 70	: 76	: 79	: 96	: 100	: 110	: 64
Motor vehicles and equipment .....	: 666	: 708	: 490	: 594	: 553	: 519	: 582	: 651	: 678	: 713	: 807	: 840	: 41
Petroleum refining and extraction ..	: 187	: 230	: 151	: 147	: 178	: 166	: 178	: 181	: 190	: 211	: 206	: 222	: 51

<sup>1/</sup>National Science Foundation, Funds for Research and Development in Industry, 1957, pp. 73 and 74; 1958, p. 70; and National Science Foundation, Research and Development in Industry, 1967, NSF 69-28, Jan. 1968, p. 73.

<sup>2/</sup>Figure was edited on basis of 1964 report, same series, p. 81.

Note: NA means not available.

A National Science Foundation survey found numerous executives (particularly line-operation managers) referring to target R and D/sales ratios. R and D managers, however, did not consider that their firms used such ratios to establish R and D budgets. <sup>14/</sup> To examine such contentions, we computed correlations, adopting R and D expenditures as the dependent variable. Sales, advertising expenditures, and taxable income, with the trend removed, were used as the independent variables. The results suggest that, of the three independent variables, sales was most important. However, the 11-percent variation in R and D expenditures explained by sales could have occurred because of chance.

### Labor Relations

Changes in wages, salaries, and fringe benefits occurring during 1954-66 offer one indicator of how labor relations fared. Because IRS in its Source Book does not disaggregate the wages and salaries of production and nonproduction workers, either separately or as a total, estimates for 1954 and 1966 were made. Source Book and sample data were used. <sup>15/</sup>

<sup>13/</sup>National Science Foundation, Review of Data on Research and Development, NSF 64-6, No. 44, Feb. 1964, p. 4. "R & D activities, i.e., R & D output and results achieved by OTHER firms, were important in determining the specific needs for (usually more) research."

<sup>14/</sup>National Science Foundation, Research and Development in Industry, 1967, NSF 69-28, Jan. 1968, p. 74.

<sup>15/</sup>IRS tabulated these items from tax returns for 1966 for a sample of firms specified by the U.S. Department of Agriculture (USDA).

The aggregate wages of production and nonproduction workers, excluding executive compensation, were determined for 1966 for the sample. We then divided this aggregate by total deductions (costs) reported in the sample to ascertain the proportion of total costs represented by this wage and salary aggregate. The proportion was 14.0 percent. The assumption was made that this proportion remained relatively stable over the study period. Since the proportion was computed for 1966, any gains through technology and the substitution of capital for labor were incorporated implicitly in the proportion. If there were a bias, the figures for 1954 would be lower than they would be if we had a sample for 1954 with which to compute the same proportion.

Given this assumption, the 14-percent figure was applied to the total deductions data of the Source Book universe for both 1954 and 1966. Because the number of firms varied each year, we divided these estimates by the number of firms to place the costs on an average per firm basis. In 1954, the per firm wages and salaries expenditures approximated \$582,000 and in 1966, \$861,000. The increase per firm in their expenditures was 47.9 percent.

As a check on the relative accuracy of the sample from which the estimating ratio was obtained, a comparison was made of the ratio of cost-of-goods sold to total deductions, with figures identical to both sample and universe in level of aggregation and form in which they were reported. The 1966 universe figure was 74.7, and the sample figure was 76.7, a difference of 2 index points, or about 3 percent.

The Source Book reports fringe benefits. Table 7 presents the average fringe benefits paid per firm, along with other average costs discussed later in this report. Between 1954 and 1966, the average fringe benefits increased from about \$446,600 to \$912,100 per year. This increase was not continuous, but the trend was distinctly upward, particularly since 1964.

Table 7.--Mean costs per firm, farm machinery and equipment industry, 1954-66 1/

Year	: Number of : returns filed	: Compensation of : officers	: Fringe benefits	: Total : deductions
			<u>1,000 dol.</u>	
1954 .....	732	24.1	446.3	4,157.5
1955 .....	687	30.2	531.7	5,090.2
1956 .....	569	30.0	702.1	6,369.2
1957 .....	628	35.0	671.2	5,877.0
1958 .....	809	29.0	602.1	4,440.4
1959 .....	847	30.3	565.5	4,214.6
1960 .....	837	28.6	598.9	4,122.3
1961 .....	974	28.1	521.9	3,576.6
1962 .....	829	31.1	625.7	4,429.0
1963 .....	984	33.3	576.9	4,197.2
1964 .....	1,073	24.0	568.3	4,061.2
1965 .....	1,041	33.1	670.9	4,775.1
1966 .....	968	40.7	912.1	6,147.6

1/Source Book, op. cit.; figures divided by the number of returns.

On the basis of average expenditures per firm, wages and salaries increased 48.0 percent between 1954 and 1966, and fringe benefits, 104.4 percent.

## Executive Compensation

All companies pay their executives, but industries differ in their emphasis on salaries, bonuses, and other forms of executive compensation. Interest in executive compensation as a conduct item has increased as more and more firms have hired management. <sup>16/</sup> Here, we comment on three relevant points: (1) The extent to which executive compensation per firm has increased between 1954 and 1966; (2) the association of executive compensation with sales, contrasted to the association of such compensation with profits; and (3) the association of such compensation with company specialization in SIC 3522, contrasted to the association with company size.

Two data sources were used: The Source Book for total expenditures, and the sample for cross-sectional comparisons related to size and the extent of the firm's specialization. The sample-based comparisons were available only for 1966. <sup>17/</sup>

Because the number of firms in the universe changed each year, the total compensation reported was placed on an average per firm basis. Most firms reported having less than 10 executives each year, and only the larger ones reported as many as 10. IRS indicated that most firms report the same number of executives each year.

Averaging took account of the changing numbers of firms from one year to the next. Since small firms, those reporting one or two executives, were predominately the ones that entered or disappeared, averaging also tended to stabilize the average number of executives covered. This meant that probably most of the reported fluctuations reflected changes in the average amount of executive compensation received by individual executives. Of course, this varied by firm, both in consistency and amounts. Changes in larger firms probably were not as erratic as in smaller firms.

Between 1954 and 1966, the annual average total expenditure per firm varied from about \$24,000 in 1954 to \$35,000 in 1957 and \$41,000 in 1966. In the other years, it fell between \$30,000 and \$33,000. Thus, there were both fluctuations and a slight upward trend. These expenditures were far less consistent, and the trend far weaker, than those for fringe benefits. The erratic behavior suggested that compensation of officers probably was associated with changes in sales or profits, or both.

Specific comparisons included associations between the total expenditures for executive compensation and items such as taxable income, total sales, retained earnings, and total number of employees.

Total expenditures for officers' compensation were associated with taxable income; the  $r$  was .51, statistically significant between the 5- to 10-percent level. Such expenditures were more highly associated with total sales; the corresponding  $r$  was .83 and statistically significant at the 1-percent level. This association includes total amounts spent for executive compensation, with both number of executives and level of executive compensation included.

Data from the purposive sample enabled some comparisons at three levels of specialization within SIC 3522: (1) establishments with 100-percent SIC 3522 activity; (2) establishments with 50.1- to 99.9-percent activity; and (3) companies with at least 0.01-percent, but less than 50.1-percent activity. Some differences in the extent of a company's specialization were perceptible. For instance, companies with

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<sup>16/</sup>For example, see: H. A. Simon, The Compensation of Executives, Sociometry, Vol. 20, Mar. 1957, p. 32.

<sup>17/</sup>The correlations for 1966 were developed from data tabulated by IRS from corporate tax returns of a sample of firms selected by USDA.

50.1- to 99.9-percent specialization had the highest association--of the three levels--between executive compensation and taxable income and between executive compensation and sales. These companies were among the larger ones in total number of employees and, hence, executive force. However, size was not a sufficient explanation, as some of the largest conglomerates that had only a few (but large) SIC 3522 establishments fell within the .01- to 50.0-percent specialization category. Yet, the difference in the association between executive compensation and taxable income was negligible--.65 for the 100-percent category and .68 for the .01- to 50.0-percent category.

The biggest differential in correlations was between the 100-percent specialization and the .01- to 50.0-percent specialization firms when executive compensation was correlated with total sales. Here, companies with 100-percent specialization in SIC 3522 had an association of  $r = .63$ , while the .01- to 50.0-percent specialization category had an  $r = .74$ .

As a separate test, firms with 100-percent specialization were compared with all firms in SIC 3522 with less than 50-percent specialization. The hypothesis tested was: There is no difference between specialized and diversified firms in the numbers of firms with greater executive compensation than the combined median. The Chi-square computed value was .13 and the contingency coefficient, .06. This high a computed Chi-square could occur because of chance as many as 72 times out of 100 and, hence, specialization of the firm was not found to exert more than a chance impact on company payments for executive compensation.

The results suggest that while extent of specialization in SIC 3522 possibly influenced the relationship, size of firm more likely was the dominant factor in differentiating associations. The emphasis on size of firm in contrast to specialization was supported by a separate comparison in which the compensation of officers of the sample firms for which employment was available was correlated with the total number of employees. The correlation of  $r = .80$  was significant at the 1-percent level.

Firms of the largest quartile were compared with firms in the smallest quartile. The hypothesis tested was: There is no difference between large and small firms in the numbers of firms with greater executive income than the combined median. The computed Chi-square value was 4.99 and the contingency coefficient was .37 out of a possible .7. The computed Chi-square value could be obtained because of chance about three times out of 100. Thus, size apparently was more than a chance association in its relationship to the amount of executive compensation paid.

These results covered total compensation. Mean executive compensation was then compared with sales and with taxable income. The resulting "r's," compared with those already computed for aggregate executive compensation, enabled us to identify the relative importance of total executive compensation and the level of compensation. Average executive compensation when associated with taxable income had an  $r$  of .32, significant at the 5-percent level. When the average executive compensation was

compared with total sales, the r was .55, significant at the 1-percent level. <sup>18/</sup> When the average executive compensation was also correlated with the total number of employees, the r was .80, and it was significant at the 1-percent level.

### Pricing

The market structure of an industry conditions the industry's pricing practices. Atomistically structured markets, like those at the farm level for fresh fruits, for example, experience continuous price fluctuations, which essentially reflect changes in supply and demand. Such fluctuations occur under general conditions of both inflation and deflation. In contrast, regulated monopolies like public utilities rarely have price changes, and changes occur only after specified administrative rituals have been performed.

Most markets fall between these extremes, and the markets for most farm machinery and equipment items are no exception. In these "inbetween" situations, both "the market" and "administrative decisions" influence prices. <sup>19/</sup> Structural and conduct features of the farm machinery and equipment industry consistent with some degree of administrative pricing included: (1) the high proportion of value of shipments accounted for by the largest 50 companies; <sup>20/</sup> (2) the growth rate of the large multiunit, multi-industry firms; <sup>21/</sup> (3) the large expenditures for advertising, research, and development by the largest firms; <sup>22/</sup> (4) the use of a model sales year for heavy-duty items; and (5) the adoption of nonprice competition in inventories carried, repair services provided, and development of written and oral guarantees and warranties.

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<sup>18/</sup>An earlier study by J. S. McGuire and associates, Executive Income, Sales, and Profits, Vol. 52, No. 4, American Economic Review, Sept. 1962, p. 758, is not directly comparable statistically for several reasons, and our results are neither a direct replication nor a test of this work. However, they are not inconsistent with these hypotheses from the McGuire study:

First, it would appear...that the line of apparent causation runs from sales to incomes rather than from incomes to sales. In other words, when the board of directors of an enterprise (or whatever person or persons make such a decision) determines executive compensation, this decision is affected significantly by current or past sales, or realized changes in sales. Executive compensation is primarily a reward for past sales results, it is not necessarily an incentive, to further sales efforts, or if it's an incentive, it has not proved to be too satisfactory....

<sup>19/</sup>"There has been some confusion as to the meaning and implications of the term 'administered price.' By some it has been taken to imply criticism or opprobrium. But it originally was introduced as a neutral technical term to distinguish prices which are set by individual companies and kept constant for periods of time from those which are set by classical competition and the law of supply and demand....

Administered prices are not new, nor is the practice of price administration in itself objectionable. On the contrary, administered prices are an essential part of our modern economy. They can contribute to greater efficiency and lead to higher standards of living. Big industry could not operate without them....

What is important is that administered prices lie outside of classical economic theory.... The implications...for public policy are far from clear. There is no body of economic theory which establishes the conditions under which administered prices will be so set as to serve the public interest" (emphasis added).

Gardner C. Means, Pricing Power and the Public Interest, Harper & Brothers, New York, 1962, excerpts, pp. 11-12.

<sup>20/</sup>77 percent, see p.9.

<sup>21/</sup>Such firms with 500 or more employees grew by 75 percent, 1958-63, see p. 7.

<sup>22/</sup>See pp. 10 and 12.

More directly related were the relationship of prices to total deductions and the overall pattern of the prices themselves. Table 8 shows several indexes, including those for (1) prices at the manufacturer-dealer level and (2) total deductions by manufacturers of farm machinery and equipment. From 1954 to 1966, the price index moved upward annually, except in 1965. It rose from 88.1 in 1954 to 118.5 by 1966 (1957-59 = 100). Total deductions rose in all but 3 years, starting from 83.9 in 1954 and ending with 164.5 in 1966. Both gross value of shipments and the "real quantity" index, as well as profits, rose in 1958 and 1959, but dropped in 1960. However, for 3 consecutive years, 1958-60, total deductions dropped as prices rose, from 96.3 in 1957 to 107.4 in 1961. <sup>23/</sup> Conversely, in 1965, when prices dropped to 108.2 (from 112.9

Table 8.--Specified conduct measures, farm machinery and equipment industry, 1954-66 <sup>1/</sup>  
(1957-59 = 100)

Year	Prices to dealers	Total receipts	Total deductions	Average total assets per firm
1954	88.1	83.9	84.1	82.4
1955	88.9	97.7	96.7	94.6
1956	92.0	100.5	100.2	116.4
1957	96.3	101.2	102.0	110.0
1958	100.3	98.9	99.3	90.0
1959	103.4	99.9	98.7	81.5
1960	105.4	91.6	95.4	84.7
1961	107.4	92.8	96.3	71.3
1962	109.5	99.4	101.5	82.3
1963	111.1	111.7	114.2	75.0
1964	112.9	119.6	120.5	69.9
1965	108.2	137.1	137.4	81.6
1966	118.5	166.4	164.5	114.7

<sup>1/</sup>All measures are unweighted indexes (1957-59 = 100). The price index was computed from Bureau of Labor Statistics Wholesale Prices charged by manufacturers of farm machinery and equipment. The other data are from the IRS Source Book and are universe data for all firms classified in this industry each year by IRS.

<sup>23/</sup>Total deductions include depreciation. Hence, changes by IRS in the permissible depreciation practices could affect total deduction figures. Through 1953, the straight-line method of depreciating assets was the method generally acceptable to IRS and generally used. Hiemstra has shown that after the 1954 change in the Code that permitted adoption of "rapid methods," substantial changes occurred. He concluded, though: "The effects of rapid methods of depreciation authorized in the 1954 Code are at or very nearly at their maximum, making up roughly one fifth of total depreciation." S. J. Hiemstra, Rising Depreciation, Agric. Econ. Rpt. 47, Econ. Res. Serv., U.S. Dept. Agr., 1963, p. 16.

While Hiemstra focused on food and kindred products manufacturing industries, their pattern of rate of adoption should not differ markedly from that of manufacturing in total. The adoption of rapid methods should have made a difference. It should have made depreciation and total deductions rise, and indeed they did in 1956 and 1957. However, their drop in 1958-60 could have been even greater without the change in depreciation rules. Even with the rule change, they dropped. Thus, the drop in total deductions, including the adoption of rapid rates of depreciation, highlights the price rise even more.

in 1964), total deductions rose 14 percent, from an index of 120.5 to 137.4. Both value of shipments and the "real quantity" index rose in 1965. This pattern of behavior is more typical of a market where administered pricing occurs than it is of an atomistic one. <sup>24/</sup>

The BLS Wholesale Price Index for farm machinery and equipment covers 61 items, ranging from tractors to forage blowers. All are items primarily used by farmers. The monthly price index for these 61 items was used to determine month-by-month changes in the index. Of the 155 months tabulated, 110 (82.6 percent) showed no change, and 18 showed less than .5 of an index-point change. <sup>25/</sup> Since a change under .5 of an index point could well reflect sampling error, the entire category of months with less than .5 of an index-point change was defined as months without change. There were 27 months with change--17.4 percent--with 24 representing price increases and three, price decreases. This pricing pattern more closely resembled the kind expected under administered pricing than under "market" pricing. The latter would have tended to have a distribution reflecting an approximately equal division between price increases and decreases and would have recorded very few months without change.

### Performance Measures

Many economists consider that continuous interaction between market structure and market conduct results in specified kinds of performance. <sup>26/</sup> Structural changes emphasized for the farm machinery and equipment industry included the increased diversification, the entry of numerous small firms, and the exit of several large establishments and multiunit, single-industry firms. Conduct measures stressed were the increasing expenditures for advertising and, especially, R and D by large firms. <sup>27/</sup> In this section, we examine the few performance measures available. Some of them focus on establishments and a few include the entire company.

### Establishment Gains in Productivity

Productivity increases resulted in gains in both value added per man-hour and per employee. Between 1958 and 1967, with the exception of 1960, both rose in a steady trend (table 9). Value added by the manufacturer is derived by subtracting the total cost of materials, cost of resales, and miscellaneous receipts from the value of shipments and other receipts, and adjusting the resulting amount by the net change in finished products and work in process inventories between the beginning and end of the year. <sup>28/</sup>

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<sup>24/</sup>James Cooper, Toward A More Efficient Farm Machinery Industry, M.A. thesis, Mich. State Univ., East Lansing, Mich., 1968, p. 86ff. In a discussion, Biased Tendencies in Machinery and Parts Pricing, he supplies an independent analysis of tractor and parts pricing, which leads him to consider these prices to be more administered than market-determined.

<sup>25/</sup>The period covered was Jan. 1954 through Dec. 1966. Since comparisons were from 1 month to the next, the total number of changes equals 155, and not 156.

<sup>26/</sup>For instance: J.S. Bain, Industrial Organization, John Wiley & Sons, Inc., New York, 1959; R. L. Clodius and W. F. Mueller, Market Structure Analysis as an Orientation for Research in Agricultural Economics, Jour. of Farm Econ., Aug. 1961, p. 515; Paul L. Farris, Market Structure Research, Iowa State Univ. Press, Ames, 1964; and Staff Report to the Federal Trade Commission, Economic Report on Mergers, 1969, U.S. Govt. Print. Off.

<sup>27/</sup>See pp. 10 - 12.

<sup>28/</sup>Census of Manufacturers, 1963, op. cit., p. 22.



Table 9.--Selected performance measures for establishments,  
farm machinery and equipment industry, 1958-67 <sup>1/</sup>

Year	Total value added		Total costs	
	Per man-hour	Per employee	Per man-hour	Per employee
	Dol.	1,000 dol.	Dol.	1,000 dol.
1958 .....	5.15	10.0	9.10	17.7
1959 .....	5.22	10.4	9.40	18.7
1960 .....	4.76	9.5	8.89	17.7
1961 .....	5.21	10.3	9.25	18.3
1962 .....	5.75	11.4	9.51	18.8
1963 .....	5.91	11.8	10.18	20.3
1964 .....	6.39	12.9	10.89	21.9
1965 .....	6.80	13.7	11.22	22.5
1966 .....	7.40	15.0	12.37	25.0
1967 .....	7.65	15.0	12.68	24.9

<sup>1/</sup>Computed from Bureau of the Census, 1967 Census of Manufacturers, Preliminary Report, MC67, (P)-35-A-3.

Value added is not an identity with "national income originating in manufacturing." It represents a gross value greater than such income, in part because value added does not exclude purchased services. However, because the farm machinery and equipment industry does not have a large amount of purchased services, changes in value added for this industry do crudely reflect changes in productivity. The overall record by this industry is positive.

Other data published by the Census Bureau and the Bureau of Labor Statistics were combined to check this conclusion about productivity. The Census Bureau periodically publishes an index of the value of shipments of farm machinery and equipment, including wheel-type tractors. <sup>29/</sup>

The Bureau of Labor Statistics publishes a comparable price index for prices at the factory level. <sup>30/</sup> Division of the price index into the value of shipments generated a real-quantity index. Between 1958 and 1966, the real index, as computed, rose from 98.5 to 151.3; from 1966 to 1968, it dropped from 151.3 to 131.7.

### Costs

Table 9 shows total costs per man-hour and per employee (establishment basis), and both rose steadily except in 1960 and 1967. Costs per man-hour ranged from a low of \$8.89 in 1960 to \$12.68 in 1967. Costs per employee ranged from \$17,700 in 1958 and 1960 to \$25,000 in 1966. Data reported throughout earlier tables for labor relations, executive compensation, R and D, and advertising practices, explain much of this cost

<sup>29/</sup>Bureau of the Census, Current Industrial Reports, Tractors, except garden tractors, M34S (68) 12, U.S. Govt. Print. Off., table 9, p. 6, for 1964-67, and earlier issues for earlier years. (Base of 1954-1955 = 100 was shifted to one of 1957-1959 = 100 to correspond with other series used.)

<sup>30/</sup>Bureau of Labor Statistics, Price Indexes: 1963, Group 11, Machinery and Motive Products, Wholesale Price Index, U.S. Govt. Print. Off. (1957-59 = 100). This publication covers 1947-1963. Data from 1964 were obtained from BLS personnel.

increase. One source of costs not yet reported and one that has become increasingly important is State and local taxes, shown below for the farm machinery and equipment industry:

Year	Amount	Year	Amount
	<u>Thous. dol.</u>		<u>Thous. dol.</u>
1954	56,143	1961	81,236
1955	62,625	1962	86,117
1956	63,239	1963	93,963
1957	66,668	1964	96,425
1958	68,398	1965	98,918
1959	74,270	1966	128,441
1960	77,260		

Source: Source Book, op. cit.

These "people-associated costs" will tend to increase as population grows. Population growth usually results in consumer demands for more schools and police and fire protection, and improved highways. Such expenditures are important not only because of their relatively direct association with people but because of their basic character. State and local taxes increased by 128.8 percent between 1954 and 1966. As a percentage of the farm machinery and equipment industry's total costs, the State and local tax share rose from 1.8 to 2.2 percent, an increase of 22.2 percent. The probability that State and local taxes will decrease seems quite small.

Many major costs are at least partially controllable by corporate management; raw materials, packaging materials, and labor costs can be changed promptly to meet market conditions. Fixed or "quasi-fixed" costs cannot be changed. As managers encounter increases in these costs, both in absolute amounts and as a higher proportion of their operating budget, they become pressured to increase sales. Only increased sales will enable managers to reach a lower position on their longrun average total cost curve. <sup>31/</sup>

#### Company Value Added and Payroll Comparisons

Two statistics available for company comparisons were value added per employee and payroll per employee (table 10).

<sup>31/</sup>If only fixed costs increase, marginal costs remain constant. In such a circumstance, the only way to reach a lower position on either the short- or long-run average total cost (ATC) curve is for the firm's average revenue schedule to increase. If the average revenue curve shifts to the right, so will the firm's marginal revenue curve. This means that the intersection between the new marginal revenue curve and the old marginal cost curve will be to the right and, hence, the firm will have moved down its shortrun curve. If the move is substantial enough to move the firm to or near the bottom of its shortrun curve, the firm will increase its capacity, hence, obtain a new set of shortrun curves. The new shortrun ATC curve will have a lower point for its minimum cost point and will be tangent to the longrun curve at a lower point.

Table 10.--Company comparisons of value added and payroll per employee, farm machinery and equipment industry, 1958 and 1963 <sup>1/</sup>

Company category	Value added per employee			Payroll per employee		
	1958	1963	Change	1958	1963	Change
	----- Dollars -----					
All companies .....	7,878	9,521	1,643	5,330	6,611	1,281
Single-unit,						
single-industry .....	8,157	9,570	1,413	4,367	4,993	626
Multunit .....	7,815	9,512	1,697	5,546	6,908	1,362
Multunit, single-						
industry (SIC 3522) ...	9,040	11,898	2,859	4,867	5,427	560
Multunit,						
multi-industry .....	7,725	9,433	1,708	5,596	6,957	1,361
Multunit,						
multi-industry (only						
SIC 3522 units) .....	--	<u>2/13,417</u>	--	--	<u>2/6,765</u>	--
Multunit, multi-						
industry (all units						
other than SIC 3522) ..	--	<u>2/10,448</u>	--	--	<u>2/6,918</u>	--

<sup>1/</sup>Computed from Enterprise Statistics, 1958, op. cit., pp. 66 and 82; and 1963, p.106.

<sup>2/</sup>These figures do not include any assignment of employees from the companies' central administrative offices.

Note: Dashes indicate no breakout presented for 1958.

All SIC 3522 firms recorded consistent gains in value added and a rise in payroll costs. Cross comparisons showed some differences by type of firm. Between 1958 and 1963, all single-unit, single-industry firms increased their value added for each employee by \$1,413, and their payroll per employee by \$626. This yielded a difference of \$787 more value added per employee than payroll cost per employee. <sup>32/</sup> For the multunit, single-industry companies, the increased value added per employee averaged \$2,859 and the payroll per employee, \$560. This left a differential of \$2,335 between the increase in payroll and value added. The multunit, multi-industry companies had a value added per employee increase of \$1,708 and a per employee payroll increase of \$1,361, providing a differential of \$347. This comparison shows the multunit, single-industry companies led in increasing value added per employee and in holding down payroll per employee. However, to show the full meaning for the multunit, multi-industry company, we need an additional statistic. <sup>33/</sup> In 1963, the SIC 3522 establishments of the 35-B multiestablishment, multi-industry companies recorded a value added per employee of \$13,417, and a payroll figure per employee of \$6,765. In contrast,

<sup>32/</sup>These differences are not profits. Only payroll costs per employee, not total costs, are involved in these company comparisons.

<sup>33/</sup>Data were available only for 1963, and in the following comparisons, the employees of central administrative offices were not included. This largely explains the higher value added figures, \$10,448 and \$13,417, as against \$9,433 in table 10.

the non-SIC 3522 sister establishments reported a value added figure per employee of \$10,448, and a payroll figure per employee of \$6,918. Thus, for 1963, the SIC 3522 establishments of 35-B firms recorded \$3,122 more value added per employee than the non-SIC 3522 establishments. <sup>34/</sup>

The competitive pressures from entry, both by new firms initiated within the industry and by firms diversifying into the industry, created a climate favorable to such gains in productivity. However, this increased productivity cannot be attributed completely to gains in labor efficiency. Some of it must be associated with capital equipment.

### Progressiveness

The performance dimension of progressiveness involves the continued willingness of an industry to update its technology and to develop new and improved products. The norm concept is there should be technological achievement. <sup>35/</sup> The conduct items reporting the expenditures for research and development and new capital equipment support the conclusion that the farm machinery and equipment industry has progressed in respect to this norm.

Between 1958 and 1963, firms with fewer than 100 employees expanded their new capital expenditures by 46.1 percent and their share of total new capital expenditures from 19.5 to 22.0 percent. Firms with 100-999 employees expanded their new capital expenditures by 37.6 percent and their share of total new capital expenditures from 24.5 to 26.0 percent. Although firms with 1,000 or more employees increased their new capital expenditures by 20.1 percent, their share in total new capital expenditures fell by 4.0 percent. <sup>36/</sup> This pattern is consistent with that of diversification into other industries by the largest firms. The data also suggest the continued substitution of capital for labor, assuming that inflationary pressures exerted on both labor and capital markets were approximately the same during the study period. Increases in total fixed costs through increased capitalization will exert continuing pressures on management to maintain and, where possible, increase sales. More sales would permit production to occur at a lower point on the firm's longrun average total cost curve.

The data used suggest that large increases in numbers of establishments with more than 500 employees will be unlikely in the farm machinery and equipment industry. This size category lost establishments from 1958 to 1963. However, this does not preclude the growth of more companies of much greater size and quite diversified, both in product and in kind of industries covered.

The data relating executive compensation to sales and size of firm are consistent with each management's desire for its company to grow larger. The larger company would straddle multiple industries. This cross-industry diversification would tend to

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<sup>34/</sup>The difference between the value added and payroll figures per employee for the SIC 3522 establishments was \$6,652 and for the non-SIC 3522 establishments, \$3,530. Net difference equaled \$3,122.

<sup>35/</sup>Paul L. Farris, Market Structure Research, op. cit., p. 153.

<sup>36/</sup>1958 Census of Manufacturers, op. cit., 1958, p. 35-A-9; and 1963, p. 25-A-11.

contribute to profit stability. <sup>37/</sup> Also, expenditures for research and development by the largest farm machinery and equipment firms suggest that they have focused on two aspects; new machinery products, including farm, and products within other industries.

In 1964, R and D expenditures by firms within 35-B ranged over 10 industries. Eighty-six percent of these expenditures were for machinery products, including farm, and 14 percent included products from the following industries: paper and allied products, industrial chemicals, primary metals, electrical equipment and communications, motor vehicles and transportation, and aircraft and missiles. By 1967, the proportion spent on machinery products had dropped to 78 percent, and 22 percent was spread over 13 industries, including food and kindred products and professional and scientific instruments. <sup>38/</sup>

### Profits

Profits long have been used as a measure of performance. Since the owners--that is, stockholders--usually receive them, profits after taxes as a percentage of net worth are used as the basis for comparison of the farm machinery and equipment industry with three other industries (table 11). Here, net worth is defined as the sum of the value of preferred stock, common stock, amounts paid in surplus, surplus reserve, and earned surplus and undivided profits.

Stigler has commented that "Preferred stockholders may be considered as lenders," rather than as owners. <sup>39/</sup> If we had considered them as lenders, the rates of return for the farm machinery and equipment industry would have changed at most by .71 of a percent. For instance, in 1955, the percentage of profits after taxes as a percentage of net worth was 6.79 percent, with preferred stock included as part of net worth. It would have been 7.50 percent if preferred stock had been excluded from net worth. The amount of preferred stock outstanding for this industry had decreased to a negligible amount by 1966.

The profit rates for the farm machinery and equipment industry showed a marked variation, ranging from a low of 1.34 percent in 1960 to a high of 10.93 percent in 1966 (table 11). <sup>40/</sup> The return to large corporations was higher from 1954 to 1960, but lower thereafter except for 1964. These profit returns are consistent with the drop in the numbers of large single-establishment firms, and multiunit, single-industry firms of 500 or more employees between 1958 and 1963.

As mentioned, three other industries offered profit records for comparisons. The first, engine and turbines, and the second, durable goods, are similar--in the degree of capitalization needed--to farm machinery and equipment, while baking, the third, differs. The rate of interest for prime commercial paper gives, of course, another figure for an "opportunity cost" comparison. A firm's profit rate should (over time) equal or exceed this rate or the firm should consider shifting its resources.

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<sup>37/</sup>Richard J. Arnould, *Diversification and Profitability Among Large Food Processing Firms*, Agric. Econ. Rept. 171, Econ. Res. Serv., U.S. Dept. Agr., Jan. 1970, p. iv.

<sup>38/</sup>National Science Foundation, *Basic Research, Applied Research, and Development in Industry*, NSF 66-28, 1963, p. 89; and NSF 69-28, 1966, p. 81.

<sup>39/</sup>George J. Stigler, *Capital and Rates of Return in Manufacturing Industries*, Princeton Univ. Press, Princeton, N. J., 1963, p. 124.

<sup>40/</sup>For the farm machinery and equipment industry, retained earnings (income after taxes minus disbursements of payments to stockholders) as a percentage of net worth trended downward from 4.15 percent in 1954 to 3.34 in 1966. Fluctuations in between ranged from a high of 4.30 in 1957 to a low of 3.36 in 1963.

Table 11.--Profit as a percentage return to net worth, specified industries,  
1954-66 <sup>1/</sup>

Year	: Farm machinery and equipment :		Engines :	All :	Interest rate,	
	: Industry:	: All firms with \$250 :	and :	durable :	: Baking :	
:	: million assets :	turbines :	goods <sup>2/</sup> :	industry :	: prime commercial :	
:	: or above :	:	:	:	: paper, average :	
:	:	:	:	:	: 4-6 mos. <sup>3/</sup> :	
----- Percent -----						
1954 .....	5.04	6.42	7.2	10.2	8.1	1.58
1955 .....	6.79	8.50	9.8	13.8	9.7	2.18
1956 .....	6.09	8.26	12.3	12.7	8.8	3.31
1957 .....	4.79	6.43	11.7	11.2	8.8	3.81
1958 .....	5.08	5.87	9.4	8.0	8.3	2.46
1959 .....	8.10	8.33	12.0	10.4	8.0	3.97
1960 .....	1.34	1.52	5.4	8.5	8.1	3.85
1961 .....	2.12	1.84	4.8	8.1	6.7	2.97
1962 .....	NA	NA	NA	9.7	NA	3.26
1963 .....	5.67	5.61	8.8	10.2	7.0	3.55
1964 .....	7.60	9.30	11.1	11.8	7.3	3.97
1965 .....	9.61	9.53	12.1	13.9	7.8	4.38
1966 .....	10.93	10.27	15.2	14.2	8.2	5.55

<sup>1/</sup>Computed from Source Book, op. cit.

<sup>2/</sup>U.S. Government, Economic Report of the President, U.S. Govt. Print. Off., Feb. 1970, p. 261.

<sup>3/</sup>Ibid., p. 242.

Note: NA means not available.

Only in 1965 and 1966 did the profit rate for the farm machinery and equipment industry exceed the rate for any of the other industries, by surpassing that of baking. After comparing the rates of all these industries with the rate of interest for prime commercial paper, we found that all but farm machinery and equipment exceeded this rate of interest every year. In 1960 and 1961, farm machinery and equipment fell below the rate for prime commercial paper.

Thus, while profits in 1958 and 1959 for the farm machinery and equipment industry reflected the rise in price and drop in costs reported earlier, they still did not exceed profits received by other industries. They did exceed the rate of interest for prime commercial paper except in 1960 and 1961. We would anticipate that an industry's profits would be as high as this rate of interest, for if they were not, over time the opportunity costs of staying in the industry's line of endeavor would be too great.

The overall performance of the farm machinery and equipment industry compares favorably with that of many other industries for the 1954-66 period. However, changes in structure and conduct occurring then carry structural and conduct implications for the future.

#### A LOOK AHEAD

Trends in the industry's structure noted in this report may continue in future years. If they do, certain consequences may flow through farm machinery and equipment retailers to farmers.

The most significant trends in structure from the farmer's point of view were the declining size of establishments manufacturing farm machinery and equipment and the diversification of companies controlling such establishments. Most farm machinery and equipment establishments are probably not large enough to capture economies of scale available in R and D, advertising, information-retrieval systems, labor relations, financing, and other company facilitating and management functions. Thus, relatively few establishments are likely to survive independently. Most will be part of multiunit companies, and the 1958-63 trend was very strongly toward their being diversified rather than specialized companies.

Continued and increasing diversification at the manufacturers' level implies that firms owning SIC 3522 plants will become less and less dependent on farm machinery and equipment sales for company profits. Company policy respecting advertising, R and D, pricing, and services will be viewed within a total company context, which means the farm machinery and equipment segment will diminish in relative importance. The manager of an SIC 3522 establishment that is a component of a multiunit, multi-industry company will find himself competing with the managers of establishments in activities other than the manufacture of farm machinery and equipment. He will have to battle for his share of the total company budget.

Increasing diversification across industries could lead to intensified competition. However, the structure of the farm machinery and equipment industry and the history of its pricing suggests that competition in the short run will continue to emphasize advertising, quality, and services, rather than price. Such behavior is more typical of members of an oligopolistic industry than of either an atomistic industry or a monopoly.

Continued pressures to increase wages, salaries, and fringe benefits will encourage intensified efforts to substitute capital for labor. Increased productivity will offset such increased costs, at least partially. However, within the farm machinery and equipment industry, production economies at the establishment level perhaps have been captured. <sup>41/</sup> It is less likely that, over time, organizational economies can completely offset increased costs.

If sales continue to increase at the rate exhibited during the 1954-66 period, market structure and conditions will facilitate transfer of some, if not all, cost increases from the manufacturer to the dealer.

The extent to which retail farm machinery and equipment dealers can pass price increases on to farmers is largely contingent on the industry's structure, the extent of competition in its local markets, and farm income. While this report did not focus on the farmer-dealer level, Census data show that between 1958 and 1963, the number of retail dealer establishments dropped by about 14 percent, while the remaining establishments' total value of sales increased by about the same amount. <sup>42/</sup>

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<sup>41/</sup>The number of establishments with more than 500 employees during 1958-63 decreased in number, while those with fewer than 100 employees gained, as shown in tables 1-3.

<sup>42/</sup>Bureau of the Census, Census of Business, 1963, Retail Trade-Summary Statistics, Vol. 1, part 1, U.S. Govt. Print. Off., pp. 1-6. The average number of establishments per county dropped from 6.2 to 5.4. Also, the average volume of sales per county rose by about \$144,569.

As retail dealers become larger and more diversified (perhaps as complete farm service centers) in their product and service offerings, and fewer in number, they may strengthen their bargaining position with farmers. <sup>43/</sup> This in part is because barriers to entry on the part of other dealers will increase. However, farm enterprises are also becoming larger and fewer in number and financial barriers to entry for new farmers are considerable.

Changes now occurring in industry structure and the diversification of dealers' sales portfolios may enable these dealers to better coordinate their sales policies and activities with manufacturers and wholesalers of farm machinery and equipment and other products. As such changes in structure intensify, the retail level, like the manufacturing level, may stress new and improved products and services, but not price competition. In fact, at the retail level, the prices for costly items may become even more administered than they now are. Such a development will facilitate the passage of cost increases from the manufacturer's to the dealer's level.

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<sup>43/</sup>James R. Cooper notes many persons, including some manufacturers, believe there are too many retail dealers even after the decline in numbers reported above. Toward A More Efficient Farm Machinery Industry, op. cit., p. 106 ff.





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